

I Claim:

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1. A method of producing an amorphous hydrogenated silicon film resistant to metastable degradation, comprising the steps of:

- 5 exposed surface;
- (a) growing a hydrogenated amorphous silicon film, the film having an
- (b) illuminating the surface with an essentially blue or ultraviolet light to form high densities of a light induced defect near the surface; and
- (c) etching the surface to remove the defect.

2. The method of claim 1 further comprising using the amorphous

10 hydrogenated silicon film in an electronic, optoelectronic, or photovoltaic device.

3. The method of claim 1 wherein the defects are in a near-surface region extending 1,000-10,000Å into the film surface.

4. The method of claim 1 wherein etching comprises using a liquid etchant to remove 500 - 10,000Å of the surface.

15 5. The method of claim 1 wherein etching comprises using a reactive hydrogen in a plasma or chemical vapor deposition reactor to remove 500 - 10,000Å of the surface.

6. The method of claim 1 further comprising after etching, repeating the steps of illuminating and then etching for a plurality of cycles wherein a population of a two-hydrogen

20 complexes is increased in a bulk of the film.

7. The method of claim 6 wherein the plurality of cycles is for a number sufficient to reduce the hydrogenated amorphous silicon film to a predetermined thickness.

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of claim 1.

8. A hydrogenated amorphous silicon film produced according to the method

of claim 3.

9. A hydrogenated amorphous silicon film produced according to the method

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of claim 6.

10. A hydrogenated amorphous silicon film produced according to the method

11. The method of claim 1 wherein growing, illuminating, and etching are performed as steps in an a-Si:H film deposition process.

12. The method of claim 3 wherein growing, illuminating, and etching are performed as steps in an a-Si:H film deposition process.

13. The method of claim 6 wherein growing, illuminating, and etching are performed as steps in an a-Si:H film deposition process.

14. The method of claim 1 wherein the a-Si:H further comprises an alloy selected from the group consisting of a-SiGe:H and a-SiC:H.

15. The method of claim 3 wherein the a-Si:H further comprises an alloy selected from the group consisting of a-SiGe:H and a-SiC:H.

16. The method of claim 6 wherein the a-Si:H further comprises an alloy selected from the group consisting of a-SiGe:H and a-SiC:H.

17. The method of claim 9 wherein the a-Si:H further comprises an alloy selected from the group consisting of a-SiGe:H and a-SiC:H.

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